

REGIONAL COMPETITION - ROUND 13

TOSS-UP

1. MATH; Multiple Choice: What is the number of "Books" in Euclid's Elements?
 - a) 10
 - b) 11
 - c) 12
 - d) 13

ANSWER: D--THIRTEEN (13)

BONUS

1. MATH; Short Answer: What does Euclid define in his first book of the Elements by saying ". . .(it) is that which has no part"?

ANSWER: A POINT

TOSS-UP

2. PHYS; Multiple Choice: A superconductor is based on an effect first observed by the Dutch physicist Kamerlingh-Onnes in 1911, in which:
 - a) a conductor becomes super strong at low temperature
 - b) the current density can become infinite at low temperature
 - c) an electrical cascade occurs
 - d) a current experiences no electrical resistance

ANSWER: D--A CURRENT EXPERIENCES NO ELECTRICAL RESISTANCE

BONUS

2. PHYS; Short Answer: An electrical discharge ionizing the air around a conductor is called:

ANSWER: CORONA

TOSS-UP

3. BIOL; Multiple Choice: Bacteria and cyanobacteria belong to which Kingdom?
- a) Protista
 - b) Monera
 - c) Fungi
 - d) Plantae

ANSWER: B--MONERA

BONUS

3. BIOL; Short Answer: Bacteria reproduce by what method?

ANSWER: BINARY FISSION (ACCEPT CYTOKINESIS)

TOSS-UP

4. CHEM; Multiple Choice: Which of the following is a transition element?
- a) Potassium
 - b) Neon
 - c) Copper
 - d) Aluminum

ANSWER: C--COPPER

BONUS

4. CHEM; Short answer: Which of the following phase changes is not endothermic:
- a) vaporization
 - b) sublimation
 - c) condensation
 - d) None of the above

ANSWER: C--CONDENSATION

TOSS-UP

5. COMP; Multiple Choice: How many hexadecimal digits are needed to represent one decimal digit?
- a) 1
 - b) 2
 - c) 3
 - d) 4

ANSWER: A--1

BONUS

5. COMP; Multiple Choice: What is the binary result of performing the following logical operation?
110011 AND 011011
- a) 010011
 - b) 100001
 - c) 111111
 - d) 000011

ANSWER: A--010011

TOSS-UP

6. BIOL; Multiple Choice: Insects have:
- a) four pairs of legs and three pairs of wings
 - b) three pairs of legs and two pairs of wings
 - c) four pairs of legs and two pairs of wings
 - d) three pairs of legs and three pairs of wings

ANSWER: B--THREE PAIRS OF LEGS AND TWO PAIRS OF WINGS

BONUS

6. BIOL; Short Answer: Cnidarians have what type of symmetry?

ANSWER: RADIAL

TOSS-UP

7. PHYS; Short Answer: The doorbell on your house requires a 12 volt alternating current. A transformer having a primary winding of 1,600 turns is to be used to step down your house's 120-volt alternating current. How many turns are there on the secondary winding?

ANSWER: 160 TURNS

BONUS

7. PHYS; Short Answer: State the SI unit of electromagnetic induction.

ANSWER: TESLA

TOSS-UP

8. CHEM; Multiple Choice: Which quantum number describes the orientation of an atomic orbital in space?
- a) n
 - b) l
 - c) $m_{\text{sub } s} (M_s)$
 - d) $m_{\text{sub } l} (M_l)$

ANSWER: D--M SUB L

BONUS

8. CHEM; Multiple Choice: Which type of orbital is not allowed?
- a) $1s$
 - b) $5f$
 - c) $4d$
 - d) $2d$

ANSWER: D--2D

TOSS-UP

9. ASTR; Multiple Choice: What percent of the lunar surface is observable from the Earth at least part of the time?
- a) 100 percent
 - b) 59 percent
 - c) 51 percent
 - d) 50 percent

ANSWER: B--59 percent

BONUS

9. ASTR; Short Answer: What fraction of the lunar surface is sometimes but not always, observable from Earth when the moon is "up"?

ANSWER: 18 PERCENT (ACCEPT 17-19 PERCENT)

TOSS-UP

10. PHYS; Short Answer: A projectile is fired into the air at an angle of 23 degrees. At what other angle would this projectile have the same range if air resistance is neglected?

ANSWER: 67 DEGREES

BONUS

10. PHYS; Short Answer: In the fission of U235, what is the average number of neutrons produced in the fission reaction per molecule?

ANSWER: 2-3 (ACCEPT ANY VALUE BETWEEN 2 AND 3)

TOSS-UP

11. CHEM; Multiple Choice: The chemical agent dioxin can be toxic or hazardous to humans in concentrations as small as one part per billion. If I am testing a soil sample that has a mass of 1.0 kg, how much dioxin would have to be present for me to label it toxic or hazardous?
- a) a picogram
 - b) a nanogram
 - c) a microgram
 - d) a milligram

ANSWER: C--A MICROGRAM

BONUS

11. CHEM; Multiple Choice: A solid has a very high melting point, is very hard and its liquid is nonconducting. The solid is:
- a) a molecular solid
 - b) a metallic solid
 - c) a covalent network solid
 - d) an ionic solid

ANSWER: C--A COVALENT NETWORK SOLID

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TOSS-UP

12. BIOL; Multiple Choice: The liver has numerous functions; among them, the liver breaks down glycogen to maintain the content of what substance in the blood?
- a) glucose
 - b) oxygen
 - c) hemoglobin
 - d) lactic acid

ANSWER: A--GLUCOSE

BONUS

12. BIOL; Short Answer: In a spinal reflex, which type of neuron takes impulses to the spinal cord?

ANSWER: SENSORY

TOSS-UP

13. ERSC; Short Answer: During what era in geologic history did dinosaurs dominate the earth?

ANSWER: THE MESOZOIC ERA

BONUS

13. ERSC; Multiple Choice: When, in Earth's history, did animals with hard parts first appear abundantly in the fossil record?
- a) middle Precambrian
 - b) start of the Cambrian Period
 - c) end of the Ordovician Period
 - d) start of the Pleistocene Epoch

ANSWER: B--START OF THE CAMBRIAN PERIOD

TOSS-UP

14. CHEM;; Short answer: How many milliliters of a 0.1 Normal Sulfuric Acid solution will it take to react with twenty milliliters of 0.1 Normal Sodium Hydroxide?

ANSWER: 20 ML

BONUS

14. CHEM; Multiple Choice: Which of the following is an exception to the octet rule:
- a) sulfate ion
 - b) boron trifluoride
 - c) ammonia
 - d) hydrogen sulfide

ANSWER: B--BORON TRIFLUORIDE

TOSS-UP

15. PHYS; Short Answer: What is the ideal efficiency of a reversible heat engine cyclically operating between a source temperature of 750 degrees Kelvin and a sink temperature of 150 degrees Kelvin?

ANSWER: 80 PERCENT

BONUS

15. PHYS; Multiple Choice: Which of the following are true statements?
- a) particles circulate in a cyclotron with constant frequency and increasing orbit
 - b) particles circulate in a cyclotron with constant frequency and constant orbit
 - c) particles circulate in a cyclotron with increasing frequency and increasing orbit
 - d) particles circulate in a cyclotron with increasing frequency and constant orbit

ANSWER: A--PARTICLES CIRCULATE IN A CYCLOTRON WITH CONSTANT FREQUENCY AND INCREASING ORBIT

TOSS-UP

16. BIOL; Multiple Choice: A disorder of the eye characterized by rapid, involuntary movements of the eyeball is called?
- a) strabismus
 - b) hyperopia
 - c) keratitis
 - d) nystagmus

ANSWER: D--NYSTAGMUS

BONUS

16. BIOL; Multiple Choice: In the human eye astigmatism is usually caused by
- a) insufficient convexity of the lens
 - b) distortion of the iris
 - c) slight flattening of the cornea
 - d) damage to the retina

ANSWER: C--SLIGHT FLATTENING OF THE CORNEA

TOSS-UP

17. CHEM; Multiple Choice: The disodium salt of ethylenediaminetetraacetic acid (ethyl-ene-die-am-me-en-tetra-ascetic) is used as:
- a) a food preservative
 - b) a complexing agent for metals
 - c) to determine the hardness of water
 - d) all of the above

ANSWER: D--ALL OF THE ABOVE

BONUS

17. CHEM; Multiple Choice: In atomic absorption spectroscopy the flame or the oven is used to:
- a) Convert the element being analyzed to the vapor state
 - b) Excite the element being analyzed to a highly charged ionic state
 - c) To dry the sample
 - d) To convert the element being analyzed to its oxide

ANSWER: A--TO CONVERT THE ELEMENT BEING ANALYZED TO THE VAPOR STATE

TOSS-UP

18. MATH; Multiple Choice: What is the geometric shape of each face of a regular dodecahedron?
- a) equilateral triangle
 - b) square
 - c) pentagon
 - d) hexagon

ANSWER: C--PENTAGON

BONUS

18. MATH; Multiple Choice: If tangent of theta = 1, then secant of theta =
- a) 1
 - b) 0
 - c) plus or minus the square root of 2
 - d) -1

ANSWER: C--PLUS OR MINUS THE SQUARE ROOT OF 2

TOSS-UP

19. ASTR; Multiple Choice: Latitude and longitude are used to locate a position on the surface of the earth. To locate the position of a star which coordinates are used?
- a) altitude and polar angle
 - b) ascension and angle
 - c) right ascension and declination
 - d) polar angle and declination

ANSWER: C--RIGHT ASCENSION AND DECLINATION

BONUS

19. ASTR; Multiple Choice: Right ascension, in either hemisphere, is measured eastward along the celestial equator from the:
- a) autumnal equinox
 - b) vernal equinox
 - c) observer's meridian
 - d) Greenwich meridian

ANSWER: B--VERNAL EQUINOX

TOSS-UP

20. BIOL; Short Answer: What is the technical name for the first vertebrates believed to have crawled onto land?

ANSWER: TETRAPODS

BONUS

20. BIOL; Multiple Choice: The photoreceptors responsible for color vision are called:
- a) cornea
 - b) iris
 - c) rods
 - d) cones

ANSWER: D--CONES

TOSS-UP

21. GENR; Short Answer: Which independent Federal agency is responsible for licensing and regulating civilian nuclear power plants?

ANSWER: NUCLEAR REGULATORY COMMISSION

BONUS

21. GENR; Multiple Choice: About what percent of the electricity used in the United States was produced by nuclear power plants in 1990?
- a) 5 percent
 - b) 10 percent
 - c) 20 percent
 - d) 25 percent

ANSWER: C--20 PERCENT

TOSS-UP

22. ERSC; Multiple Choice: What agent is chiefly responsible for shaping the Earth's surface?
- a) wind
 - b) ice and glaciation
 - c) volcanism
 - d) running water

ANSWER: D--RUNNING WATER

BONUS

22. ERSC; Multiple Choice: What agent is chiefly responsible for shaping the lunar topography?
- a) solar wind
 - b) running water
 - c) meteorite impacts
 - d) plate tectonics

ANSWER: C--METEORITE IMPACTS

TOSS-UP

23. PHYS; Multiple Choice: Two identical balloons, one blown up twice as much as the other, are connected via glass tube with a closed stop-cock. Then the stop-cock is opened:
- a) the smaller balloon deflates into the bigger balloon
 - b) the bigger balloon deflates into the smaller balloon
 - c) the balloons stay the same
 - d) the balloons come to equal size

ANSWER: A--THE SMALLER BALLOON DEFLATES INTO THE BIGGER BALLOON

BONUS

23. PHYS; Multiple Choice: In a synchrotron accelerator, particles are kept in orbit by:
- a) vacuum
 - b) magnetic fields
 - c) chamber walls
 - d) nuclear forces

ANSWER: B--MAGNETIC FIELDS

TOSS-UP

24. COMP; Short Answer: What is the binary result of performing the following not or logical operation?

11001101 XOR 01101100

ANSWER: 10100001

BONUS

24. COMP; Multiple choice: What is the 4 bit binary complement representation of the number -6?
- a) 1101
 - b) 0110
 - c) 1010
 - d) 1100

ANSWER: C--1010

TOSS-UP

25. GENR; Short Answer: Name TWO chemical elements that can be used in reactor control rods to absorb neutrons and slow or shutdown the chain reaction.

ANSWER: BORON and CADMIUM

BONUS

25. GENR; Multiple Choice? Which of the following is not a significant source of methane, a powerful "greenhouse" gas?
- a) cattle
 - b) marshlands
 - c) wheat farming
 - d) termites

ANSWER: C--WHEAT FARMING
